

What is claimed is:

1. A thermal processing roller which includes a heat transfer medium flowing path therein and heats a member to be processed  
5 abutting against a surface of the roller or absorbs heat therefrom by heat transfer fluid flowing through the heat transfer medium flowing path,

wherein a sealed chamber extending in a longitudinal direction of the roller and in which heat transfer medium of vapor-liquid  
10 two phases is sealed is formed within a thick portion of the roller.

2. A thermal processing roller according to claim 1, further comprising an electromagnetic induction heating mechanism.

15 3. A temperature control apparatus for the thermal processing roller according to claim 1, comprising:

heat transfer fluid supply unit for supplying heat transfer fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of  
20 the heat transfer fluid supplied from the heat transfer fluid supply unit;

first temperature control unit for comparing a temperature detected by the first temperature sensor with a first setting temperature to control a temperature of the heat transfer fluid  
25 to the first setting temperature;

a second temperature sensor for detecting a surface temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature different from the first setting temperature to control a temperature of the heat transfer fluid to the second setting temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined range, whilst changes into the first temperature control unit when the difference exceeds the predetermined range.

4. A temperature control apparatus for the thermal processing roller according to claim 2, comprising:

heat transfer fluid supply unit for supplying heat transfer fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heat transfer fluid supplied from the heat transfer fluid supply unit;

first temperature control unit for comparing a temperature detected by the first temperature sensor with a first setting temperature to control a temperature of the heat transfer fluid to the first setting temperature;

a second temperature sensor for detecting a surface temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature different from the first setting temperature to control a temperature of the heat transfer fluid to the second setting temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined range, whilst changes into the first temperature control unit when the difference exceeds the predetermined range.

15        5. A temperature control apparatus for the thermal processing roller according to claim 1, comprising:

heated transfer fluid supply unit for supplying heated transfer fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heated transfer fluid supplied from the heated transfer fluid supply unit;

first temperature control unit for comparing a temperature detected by the first temperature sensor with a first setting temperature to control a temperature of the heated transfer fluid to the first setting temperature;

a second temperature sensor for detecting a surface temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature lower than the first setting temperature to control a temperature of the heated transfer fluid to the second setting temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first temperature control unit when the difference exceeds the predetermined value.

15        6. A temperature control apparatus for the thermal processing roller according to claim 2, comprising:

heated transfer fluid supply unit for supplying heated transfer fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heated transfer fluid supplied from the heated transfer fluid supply unit;

first temperature control unit for comparing a temperature detected by the first temperature sensor with a first setting temperature to control a temperature of the heated transfer fluid to the first setting temperature;

a second temperature sensor for detecting a surface temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature lower than the first setting temperature to control a temperature of the heated transfer fluid to the second setting temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first temperature control unit when the difference exceeds the predetermined value.

15 7. A temperature control apparatus for the thermal processing roller according to claim 1, comprising:

heat absorbing fluid supply unit for supplying heat absorbing fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heat absorbing fluid supplied from the heat absorbing fluid supply unit;

first temperature control unit for comparing a temperature detected by the first temperature sensor with a first setting temperature to control a temperature of the heat absorbing fluid to the first setting temperature;

a second temperature sensor for detecting a surface temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature higher than the first setting temperature to control a temperature of the heat absorbing fluid to the second setting temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first temperature control unit when the difference exceeds the predetermined value.

8. A temperature control apparatus for the thermal processing roller according to claim 2, comprising:

heat absorbing fluid supply unit for supplying heat absorbing fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heat absorbing fluid supplied from the heat absorbing fluid supply unit;

first temperature control unit for comparing a temperature detected by the first temperature sensor with a first setting temperature to control a temperature of the heat absorbing fluid to the first setting temperature;

a second temperature sensor for detecting a surface temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature higher than the first setting temperature to control a temperature of the heat absorbing fluid to the second setting temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first temperature control unit when the difference exceeds the predetermined value.

9. A temperature control apparatus for the thermal processing roller according to claim 3, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

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10. A temperature control apparatus for the thermal processing roller according to claim 5, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

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11. A temperature control apparatus for the thermal processing roller according to claim 7, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

12. A temperature control apparatus for the thermal processing roller according to claim 4, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

13. A temperature control apparatus for the thermal processing roller according to claim 6, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

14. A temperature control apparatus for the thermal processing roller according to claim 8, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

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15. A thermal processing roller which includes a heat transfer medium flowing path therein and heats a member to be processed abutting against a surface of the roller or absorbs heat therefrom by heat transfer fluid flowing through the heat transfer medium flowing path,  
5 wherein a plurality of sealed chambers each extending in a longitudinal direction of the roller and in each of which heat transfer medium of vapor-liquid two phases is sealed are formed within a thick portion of the roller along an outer peripheral  
10 surface of the roller, tubes respectively penetrating within the sealed chambers in a longitudinal direction thereof are provided, and the tubes are used as the heat transfer medium flowing path.

16. A thermal processing roller according to claim 15,  
15 further comprising an electromagnetic induction heating mechanism.

17. A temperature control apparatus for the thermal processing roller according to claim 15, comprising:  
20 heat transfer fluid supply unit for supplying heat transfer fluid to the thermal processing roller;  
a first temperature sensor for detecting a temperature of the heat transfer fluid supplied from the heat transfer fluid supply unit;  
25 first temperature control unit for comparing a temperature

detected by the first temperature sensor with a first setting temperature to control a temperature of the heat transfer fluid to the first setting temperature;

a second temperature sensor for detecting a surface  
5 temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature different from the first setting temperature to control a temperature of the heat transfer fluid to the second setting  
10 temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined range, whilst changes into the first  
15 temperature control unit when the difference exceeds the predetermined range.

18. A temperature control apparatus for the thermal processing roller according to claim 16, comprising:

20 heat transfer fluid supply unit for supplying heat transfer fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heat transfer fluid supplied from the heat transfer fluid supply unit;

25 first temperature control unit for comparing a temperature

detected by the first temperature sensor with a first setting temperature to control a temperature of the heat transfer fluid to the first setting temperature;

a second temperature sensor for detecting a surface  
5 temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature different from the first setting temperature to control a temperature of the heat transfer fluid to the second setting  
10 temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined range, whilst changes into the first  
15 temperature control unit when the difference exceeds the predetermined range.

19. A temperature control apparatus for the thermal processing roller according to claim 15, comprising:

20 heated transfer fluid supply unit for supplying heated transfer fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heated transfer fluid supplied from the heated transfer fluid supply unit;

25 first temperature control unit for comparing a temperature

detected by the first temperature sensor with a first setting temperature to control a temperature of the heated transfer fluid to the first setting temperature;

a second temperature sensor for detecting a surface  
5 temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature lower than the first setting temperature to control a temperature of the heated transfer fluid to the second setting  
10 temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first  
15 temperature control unit when the difference exceeds the predetermined value.

20. A temperature control apparatus for the thermal processing roller according to claim 16, comprising:

20 heated transfer fluid supply unit for supplying heated transfer fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heated transfer fluid supplied from the heated transfer fluid supply unit;

25 first temperature control unit for comparing a temperature

detected by the first temperature sensor with a first setting temperature to control a temperature of the heated transfer fluid to the first setting temperature;

a second temperature sensor for detecting a surface  
5 temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature lower than the first setting temperature to control a temperature of the heated transfer fluid to the second setting  
10 temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first  
15 temperature control unit when the difference exceeds the predetermined value.

21. A temperature control apparatus for the thermal processing roller according to claim 15, comprising:

20 heat absorbing fluid supply unit for supplying heat absorbing fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heat absorbing fluid supplied from the heat absorbing fluid supply unit;

25 first temperature control unit for comparing a temperature

detected by the first temperature sensor with a first setting temperature to control a temperature of the heat absorbing fluid to the first setting temperature;

5 a second temperature sensor for detecting a surface temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature higher than the first setting temperature to control a temperature of the heat absorbing fluid to the second setting  
10 temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first  
15 temperature control unit when the difference exceeds the predetermined value.

22. A temperature control apparatus for the thermal processing roller according to claim 16, comprising:

20 heat absorbing fluid supply unit for supplying heat absorbing fluid to the thermal processing roller;

a first temperature sensor for detecting a temperature of the heat absorbing fluid supplied from the heat absorbing fluid supply unit;

25 first temperature control unit for comparing a temperature

detected by the first temperature sensor with a first setting temperature to control a temperature of the heat absorbing fluid to the first setting temperature;

a second temperature sensor for detecting a surface  
5 temperature of the thermal processing roller;

second temperature control unit for comparing a temperature detected by the second temperature sensor with a second setting temperature higher than the first setting temperature to control a temperature of the heat absorbing fluid to the second setting  
10 temperature; and

switching unit for changing into the second temperature control unit when a difference between the temperature detected by the second temperature sensor and the second setting temperature is within a predetermined value, whilst changes into the first  
15 temperature control unit when the difference exceeds the predetermined value.

23. A temperature control apparatus for the thermal processing roller according to claim 17, wherein the second  
20 temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

24. A temperature control apparatus for the thermal  
25 processing roller according to claim 19, wherein the second

temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

5           25. A temperature control apparatus for the thermal processing roller according to claim 21, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near a surface of the roller.

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          26. A temperature control apparatus for the thermal processing roller according to claim 18, wherein the second temperature sensor for detecting a surface temperature of the thermal processing roller is inserted into a thick portion near  
15 a surface of the roller.

          27. A temperature control apparatus for the thermal processing roller according to claim 20, wherein the second temperature sensor for detecting a surface temperature of the  
20 thermal processing roller is inserted into a thick portion near a surface of the roller.

          28. A temperature control apparatus for the thermal processing roller according to claim 22, wherein the second  
25 temperature sensor for detecting a surface temperature of the



thermal processing roller is inserted into a thick portion near a surface of the roller.